Abstract of the Disclosure

A high density plasma (HDP) oxide film deposition apparatus and method of forming an HDP oxide film in a trench of a semiconductor substrate prevent an underlying nitride film, serving as a liner of the trench, from being torn during the plasma deposition process. A guide ring protects the semiconductor substrate within the processing chamber of the apparatus. The distance between the guide ring and the substrate is smaller than the free mean path of ions of the plasma when tuned to the frequency of the power applied to the apparatus. The power applied is also selected to minimize the momentum that the ions of the plasma can attain in a region between the substrate and the guide ring. In addition, the nitride film is formed to a thickness of only 25 – 40Å before the HDP oxide film deposition process is carried out, so that ions of the plasma can be adsorbed by the semiconductor substrate without reacting with the nitride film.